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VULNERABILITY OF SAISS GROUNDWATER RESOURCES FOR RENEWABLE DRINKING WATER PRODUCTION MOROCCO

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ABSTRACT

The problem of water pollution affects the whole world including groundwater which is more susceptible to contamination by residues of industry, agriculture and domestic wastewater leading to the emergence of many serious epidemic and toxic diseases (methemoglobinemia, saturnism, fluorosis, cholera, typhoid, amoebiasis,…etc). The purpose of our present study is to evaluate the impact of agricultural intensification and discharge of untreated sewage on the physical, chemical and bacteriological water quality of SAISS's groundwater (Saiss, Morocco). The physicochemical parameters followed are: T°C, pH, EC, NH4+, NO2-, NO3-, Cl-, F-, HCO3-, SiO2, SO42-, Boron, Dry Residue, Turbidity, Total Hardness (TH), Dissolved O2, Oxidisability and total and fecal coliforms of raw water from the boreholes.

The results reveals averages of temperature (20°C), pH (6.47), electrical conductivity (785.1 µs/cm), Nitrite (0.0093 mg/L), Nitrate (21 mg/L), Ammonia (0.093 mg/L), Chloride (141 mg/L), HCO3- (5 meq/L), Total Hardness (13.9 meq/L), dissolved Oxygen (5.6 meq/L), Oxidisability (1.71 meq/L), Silicate (4.6 mg/L), Sulfate (17.7 mg/L), boron (0.0039 mg/L), Dry Residue (0.05 meq/L), Fluoride (2.2 mg/L), Turbidity (2.17 NTU). We also noted a total absence of fecal and total coliforms (0 UFC/100ml) in the waters of the tablecloth SAISS.

This study shows that the physicochemical and bacteriological quality of the groundwater which is used as drinking water for the city of Kénitra and adjacent towns is generally good. However, high concentrations of nitrates in some wells (over 51.55 mg/L) are worrisome because of the serious health consequences (methemoglobinemia).

For sustainable use, policymakers must protect the aquifer against the anarchic development of agriculture and spreading not reasonable enormous masses of pesticides and fertilizers.

Key words: Drinking water, Morocco , Physicochemical, Saiss , Nitrate.

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1. INTRODUCTION

In Morocco groundwater is an important part of the hydraulic heritage of the country REEM [1]. Groundwater, often protected geologically, is exposed to agricultural, industrial or urban pollution.

In this coastal region, in addition to marine disturbances (seawater intrusion), water resources are increasingly threatened by pollution from urban, agricultural, industrial and artisanal origin. Indeed, this urbanization has led to demands for ever increasing water and generated polluted sites that multiply without any protection of the environment. Pollution of groundwater is one of the most disturbing aspects and the use of these waters for food is a health hazard. Given the high demand for water for demographic growth and related industrial development, water pollution is increasing day by day Laferriere *et al* [2]. The World Health Organization WHO [3] estimated that 80% of diseases that affect the world's population are directly related to water, which implies the need to treat the water.

This work focuses on the study of the quality of the groundwater SAISS, monitoring of physico-chemical and bacteriological parameters of water representing 10 samples is well done to clarify the importance of pollution and determine the cause. Ground water analyzes in the study area were made in Laboratory of the National Office of Drinking Water (ONEP) and in University Ibn Tofaïl, Kénitra, Morocco.

2. MATERIAL AND METHODS STUDY

2.1. Area study

SAISS who is a 2300 km^2 basin is bordered on the north by the region of fes, the tablecloth sefrou, to the east by the river weht, and west by the Atlantic sea. North of the study area, the saiss basin shows a very gentle terrain in its central part. In contrast, in the western and eastern part, its altitude is 20 m. The SAISS basin has a slope of 6% to the NNW, culminates in the SE at around 250 meters and has more on the outskirts of saiss, an altitude of 10 to 30 meters. The overall morphology is a succession of hills and valleys parallel to the shore in a mean direction N030° E and N130° E locally at 150. SAISS is characterized by a well developed river system from West to East. The main rivers are Sebou, hamriya, Semento, sefrou, bab al kbir, Tahrest, Beht and Mellah. The Oued bni ouled with a total length of about 40 km, occupies the western valley. The area of its basin is about 285 km^2. In its upper reaches, hamriya river management has a N150°E, and then curves to the NW with a mean direction N030°E in the downstream portion of his career, to finally throw in the Sebou river Zouhri and Carlier [4]. The city of sefrou is located 40 km north of the fes. It is bounded by the Sebou river in the north, Lake saiss in the East and Forest SAISS in southwest. The objective of this work is to take a sample of 10 wells in 2010 (Table 1, Figure 1).

Table 1 Drilling studied

Number Wells	Flow (l/s)	Localizations
B1	156	Ain KANSARA
B2	50	El MenzAL
B3	150	Hamriya
B4	45	Oulad tayeb
B5	40	Olad mimoun
B6	100	Oulad khlifa
B7	100	Sidi barnoussi
B8	40	Al lahlalf
B9	50	El oulja
B10	50	sefrou

2.2. Study Methods

On samples of raw water of SAISS, we conducted bacteriological (fecal coliforms, total coliforms) and physico-chemical analysis (T°C, pH, EC, NH_4+, NO_2-, NO_3-, Cl-, F-, HCO_3-, SiO_2, SO_4^{2-}, Boron, Dry Residue, Turbidity, Total Hardness (TH), Dissolved O_2, Oxidisability).

The samples at the pumps are made after buckling tap and extended in order to have a permanent water quality pumping. The water samples are collected in 500 ml bottles kept refrigerated cooler (4°C) until analysis. The following physico-chemical parameters are performed using the techniques of Rodier [5]. Temperature, the potential (pH) and electrical conductivity (EC) were measured in situ using a portable multiparameter (Consort Type 835C). Nitrate (NO_3^-), Nitrite (NO_2^-), ammonia nitrogen (NH_4^+), Silicate (SiO_2), Boron (B^+), Fluoride (F^-) and sulfate (SO_4^{--}) are determined by colorimetric assay using a spectrophotometer (UV / visible Lampa 2). Hardness (TH) is measured by the volumetric method using EDTA. The oxidisability (oxidizable materials: MO) is determined by temperature oxidation in acidic medium. Bicarbonates (HCO_3^-) are analyzed by volumetric titration with 0.1N HCl. Chloride (CL^-) is determined by the solution of mercuric nitrate ($HgNO_3^-$). The title below the oxygen (O_2) determined by sodium thiosulfate solution ($Na_2S_2O_3$) 0.2 N. The dry residue determined by evaporation at 105 °C and weighed for the balance of precision 10^{-4}. Turbidity (NTU) measured by a turbidimeter: HACH brand. Model 2100N.

The microbiological groundwater SAISS is determined by the method of the most probable number (MPN) Rodier [5]. This method is to inoculate using appropriate decimal sample to analyze a series of tubes containing nutrient broth medium for searching the total flora dilutions. After incubation for 24 h at 37 °C, the tubes with a disorder are considered positive. The assessment of faecal contamination is achieved by the enumeration of faecal coliforms and faecal streptococci. Total coliforms were counted after incubation for 24 h to 48 h at 37 °C, the tubes containing the medium broth lactose bromocresol purple, fitted with a Durham (presumptive test). The positive tubes (lactose fermentation and gas production) are transplanted to a confirmatory test in a selective medium containing bile salts, bile brilliant green broth with a Durham tube, and another tube containing peptone water free indole and then incubated for 24 h to 48 h at 44 °C. Gas production in the first and in the second indole, is evidenced by the presence of fecal coliforms.

As for streptococci, their research is done on the rothe medium at 37 °C for 24 h (presumptive test). From tubes positive Rothe, a subculture is performed on middle Litsky at 37 °C for 24 h (confirmatory test). The results are expressed as number of organisms per 100

ml following statistical table Mac Crady. The results are analyzed by a statistical comparison of the mean test of Duncun [6]. From the $p < 0.05$ level, the test is taken as being significant.

3. RESULTS

The assessment of the physico-chemical and bacteriological quality of the water SAISS was followed through the analysis of water collected at the 10 drillings during the February and March 2010.

3.1. Temperature

We note that the temperature values remain almost constant (Table 2) and this is due to made that groundwater is protected from solar radiation and the atmosphere.

3.2. pH

The pH of the water varies in the study from 6.65 to 7.89 (Table 3). The values obtained are close to neutrality, while referring to the Moroccan standards ($6.5 < pH < 8.5$) for drinking water, we note that 100% of the analyzed waters are conform to human consumption. Indeed, the waters of the SAISS Kénitra not require pH adjustment.

Table 2 Evolution of the temperature of the tablecloth SAISS

Wells	February	March	Average (°C)	SD
B1	19.7	20.4	20.05	0.35
B2	20.1	21.2	20.65	0.55
B3	19.8	20.7	20.25	0.45
B4	19.6	20.3	19.95	0.35
B5	20	20.6	20.3	0.3
B6	19.9	20.2	20.05	0.15
B7	21.9	20.4	21.15	0.75
B8	20	20	20	0
B9	21.8	20.6	21.2	0.6
B10	21.4	20.1	20.75	0.65

Table 3 Evolution of pH of the tablecloth SAISS 3-3- Electrical conductivity

Wells	February	March	Average	SD
B1	7.35	7.2	7.28	0.075
B2	6.86	6.65	6.755	0.105
B3	7.2	7.21	7.205	0.005
B4	7.16	7.2	7.18	0.02
B5	7.13	7.18	7.155	0.025
B6	6.8	6.9	6.85	0.05
B7	6.89	6.9	6.895	0.005
B8	7.21	7.65	7.43	0.22
B9	7.73	7.89	7.81	0.08
B10	7.45	7.33	7.30	0.06

3.3. Electrical conductivity

In our study the conductivity values range from 575 µS/cm to 954 µS/cm, the maximum allowable value (MAV) is set to 2700 µS/cm according to moroccan drinking water standards, these values are still stable and below (VMA), but the high content of this parameter is explained by the high concentration of chloride ions (Table 4).

Table 4 Evolution of the conductivity of the tablecloth SAISS 3-4- Chloride Cl^-

Wells	February	March	Average (µs/cm)	SD
B1	671	698	684.5	13.5
B2	945	878	911.5	33.5
B3	691	732	711.5	20.5
B4	882	653	917.5	53.5
B5	736	820	778	42
B6	954	879	916.5	37.5
B7	769	765	767	2
B8	754	745	749.5	4.5
B9	575	595	585	10
B10	825	835	830	5

3.4. Chloride

The chlorides are widespread in nature, generally in the form of sodium salts (NaCl) and potassium (KCl) and represent approximately 0.05% of the lithosphere. These are the oceans contain far the largest amount of chlorides in the environment.

In our study the values of the concentration of chloride ions ranged from 81.65 to 237.85 mg/L (Table 5). According to Moroccan standards of potability of water, these values are still stable and lower than the maximum value set at 750 mg/L, but the high content of this parameter is explained by the conductivity which is high and the geological rock formations that are contact with groundwater.

Table 5 Evolution of the concentration of chlorides in the tablecloth SAISS

Welles	February	March	Average (mg/l)	SD
B1	81.65	106.5	94.075	12.425
B2	102.95	102.95	102.95	0.00
B3	195.25	220.1	207.675	12.425
B4	152.65	205.9	179.275	26.625
B5	85.2	85.2	85.2	0.00
B6	213	237.85	225.425	12.425
B7	152.65	166.85	159.75	7.1
B8	113.6	124.25	118.925	5.325
B9	92.3	95.85	94.075	1.775
B10	134.9	134.9	134.9	0.00

3.5. Dissolved oxygen (O_2)

Dissolved oxygen varies during the study of 3.32 to 6.72 mg/L (Table 6). The maximum value is set between $5 < O_2 < 8$ mg O_2/L according to Moroccan standards for drinking water.

Table 6 Evolution of the O_2 concentration of the tablecloth SAISS

Wells	February	March	Average (mg/L)	SD
B1	6.72	6.35	6.535	0.185
B2	6.24	6.2	6.22	0.02
B3	3.38	3.32	3.35	0.03
B4	6.48	6.5	6.49	0.01
B5	5.67	5.64	5.655	0.015
B6	4.83	4.88	4.855	0.025

3.6. Oxidisability (with $KMnO_4$)

The oxidisability by $KMnO_4$ dissolved varies during the study from 1.0 to 3.2 mg/L O_2 (Table 7). The maximum allowable value of O_2 is 5 mg/L by Moroccan standards for drinking water Onep [7]

Table 7 Evolution of the oxidisability of tablecloth SAISS

Wells	February	March	Average (mg O2 /l)	SD
B1	2	2.08	2.04	0.04
B2	1	1.07	1.035	0.035
B3	2.2	1.93	2.065	0.135
B4	1.44	1.93	1.685	0.245
B5	2	2	2	0.00
B6	3	3.2	3.1	0.1

3.7. Turbidity (NTU)

Turbidity varies during the study of 0.78 to 3.75 NTU, the maximum value is 5 NTU by Moroccan standards for drinking water (Table 8). We find that 100% of the analyzed waters have turbidity levels below the maximum value and that are consistent with Moroccan standards, as these groundwater have natural filtration in the soil.

Table 8: Change in the turbidity of the tablecloth SAISS

Wells	February	March	Average (NTU)	SD
B1	1.03	1.25	1.14	0.11
B2	1.08	1.54	1.31	0.23
B3	0.78	1	0.89	0.11
B4	1.8	1.58	1.69	0.11
B5	0.87	0.984	0.927	0.057
B6	3.75	3.54	3.645	0.105
B7	2.35	2.24	2.295	0.055
B8	2.8	2.87	2.835	0.035
B9	3.65	3.75	3.7	0.05
B10	3.25	3.22	3.235	0.015

3.8. Dry residue

During our study, the dry residues values (Table 9) range from 0.0112 and 0.1246 mg/L. The maximum value is set at 0.5 mg/L, according to Moroccan standards of potability of water. So these values are still lower than the maximum permissible value.

Table 9: Evolution of tenure Dry Residues in tablecloth SAISS

Wells	February	March	Average (mg/l)	SD
B1	0.0553	0.0514	0.05335	0.00195
B2	0.1063	0.1246	0.11545	0 .00915
B3	0.0608	0.0245	0.04265	0.01815
B4	0.0157	0.0147	0.0152	0.0005
B5	0.0112	0.0147	0.01295	0.0051
B6	0.0624	0.0547	0.05855	0.00385

3. 9. Alkalinity (HCO_3^-)

The TAC assay is the ions HO-, HCO_3- and CO_3- present in the water, that is to say all of the basic species present. The alkali strength is a measurement of the water tenure of free carbonate and caustic alkali.

HCO_3^- water varies during the study from 4 to 6.2 meq/L (Table 10). The maximum value is 50 meq/L. According to Moroccan standards of potability of water, HCO_3^- is an indicator of the presence of ions carbonates, bicarbonates, hydroxides hardness of drinking water factor.

Table 10 Evolution of the concentration of HCO_3^- in tablecloth SAISS

Bells	February	March	Average (meq/l)	SD
B1	4,2	4,3	4,25	0.05
B2	5	5,4	5,2	0.2
B3	5,3	5	5,2	0.15
B4	4	4,6	4,3	0.1
B5	4,3	4,4	4,3	0.05
B6	4,5	5,6	5	0.55
B7	5,4	5,5	5,5	0.1
B8	4,9	4,9	4,9	0.05
B9	5,4	5,4	5,4	0.1
B10	6,2	6	6,1	0.1

3. 10. Hydrometric total (TH)

TH of water varies during the study from 11.9 meq/L to 16.6 meq/L (Table 11). The maximum for Moroccan standards of potability is the value 50 meq/L. TH is a factor indicating the presence of magnesium and calcium ions. Rock formations containing divalent metals (Mg2+, Ca2+) are responsible for this hardness.

Table 11 Evolution of the waters TH in tablecloth SAISS

Bells	February	March	Average (meq/l)	SD
B1	15.6	14.3	14.95	0.65
B2	13.7	13.4	13.55	0.15
B3	14.2	12.2	13.2	1
B4	13	14.2	13.6	0.6
B5	12	13.5	12.75	0.75
B6	15.5	16	15.75	0.25
B7	13.3	13.6	13.45	0.15
B8	13.00	13.1	13.05	0.05
B9	11.9	12.2	12.05	0.15
B10	16.6	16.2	16.4	0.2

3.11. Nitrate (NO_3^-)

The nitrate content varies during the study from 1.245 to 51.55 mg/L (Table 12). The maximum value set at 50 mg/l according to Moroccan standards of potability of water Onep [7]. Although nitrates have no direct toxic effects except at high doses, the fact that they can give birth to nitrites leads to toxicity. Nitrate levels are high for B7 which exceed the Moroccan standards.studied groundwater SAISS.

Table 12 Temporal variation of nitrate in water level of drilling

Wells	February	March	Average (mg/l)	SD
B1	47.95	45.65	46.8	1.15
B2	2.02	2.21	2.115	0.095
B3	1.459	1.245	1.352	0.107
B4	32.15	33.25	32.7	0.55
B5	4.56	4.73	4.645	0.085
B6	36.48	37.22	36.85	0.37
B7	51.55	51	51.275	0.275
B8	26.15	22.45	24.3	1.85
B9	4.34	4.54	4.44	0.1
B10	5.13	4.73	4.93	0.2

3.12. Nitrite (NO_2^-)

The nitrite content varies during the study of 0.00 to 0.032 mg/L (Table 13). The VMA nitrite is set at 0.5 mg/L according to Moroccan standards Onep [7].

3.13. Ammonium (NH_4^+)

In our study the ammonium values range from 0.00 to 0.45 mg/L (Table 14). The maximum value is set at 0.5 mg/L according to Moroccan standards of potability.

Table 13: Evolution of the concentration of nitrite in the tablecloth SAISS

Welles	February	March	Average (mg/l)	SD
B1	0	0	0	0
B2	0.001	0.0012	0.0011	0.001
B3	0	0	0	0
B4	0.003	0.0001	0.00155	0.00145
B5	0	0.002	0.001	0.001
B6	0.0014	0.0013	0.00135	0.00005
B7	0.021	0.032	0.0265	0.0055
B8	0.019	0.012	0.0155	0.0035
B9	0.0132	0.0135	0.01335	0.00015
B10	0.052	0.057	0.0323	0.0025

Table 14: Evolution of ammonium concentration in tablecloth SAISS

Wells	February	March	Average (mg/l)	SD
B1	0	0.01	0.005	0.005
B2	0.11	0.13	0.12	0.01
B3	0.01	0.12	0.065	0.055
B4	0.31	0.01	0.16	0.15
B5	0.12	0.1	0.11	0.01
B6	0.23	0.35	0.29	0.06
B7	0.045	0.042	0.0435	0.0015
B8	0.039	0.036	0.0375	0.0015
B9	0.040	0.041	0.0405	0.0005
B10	0.041	0.037	0.039	0.002

3.14. Sulfate (SO_4^-)

Sulfate vary during the study between 11.58 and 21.2 mg/L (Table 15). The maximum value is set at 400 mg/L. by Moroccan standards of potability of water, so these values are still well below the maximum allowable value. This can be justified by the presence of very low sulfate levels in the soil and groundwater in the study area Onep [7].

Table 15: Evolution of the concentration of sulfate ion in tablecloth SAIS

wells	February	March	Average (mg/l)	SD
B1	19.7	20.4	20.05	0.35
B2	20.1	21.2	20.65	0.55
B3	19.8	20.7	20.25	0.45
B4	19.6	20.3	19.95	0.35
B5	20	20.6	20.3	0.3
B6	19.9	20.2	20.05	0.15
B7	15.04	14.56	14.8	0.24
B8	13.67	14.32	13.995	0.325
B9	14.34	15.41	14.875	0.535
B10	11.66	11.58	11.62	0.04

3.15. Boron

woron varies during the study between 0.00 and 0.026 mg/L (Table 16). The maximum value is set at 0.3 mg/L, according to Moroccan standards of potability. Therefore these values are still well below the authorized maximum value.

Table 16: Evolution of the concentration of boron in tablecloth SAISS

wells	February	March	Average (mg/l)	SD
B1	0.001	0.00	0.0005	0.0005
B2	0.002	0.001	0.0015	0 .0005
B3	0.001	0.001	0.001	0.00
B4	0.0013	0.0014	0.00135	0.00005
B5	0.00	0.00	0.00	0.00
B6	0.0003	0.0013	0.0008	0.0005
B7	0.0026	0.0032	0.0029	0.0003
B8	0.0027	0.0026	0.0265	0.0005
B9	0.0001	0.0001	0.0001	0.00
B10	0.0004	0.0003	0.00035	0.00005

3.16. Fluoride (F^-)

During our study of fluoride the values range from 0.18 and 0.26 mg/L (Table 17). The maximum value is fixed at 1.5 mg/L, by Moroccan standards of potability.

3.17. Silicate

In our study the values of silicate ranged from 0.236 and 22.08 mg/L (Table 18). The maximum value is 100 mg/L, according to Moroccan standards of potability.

Table 17: Evolution of the fluoride concentration in tablecloth SAISS

Wells	February	March	Average (mg/l)	SD
B1	0.2	0.21	0.205	0.005
B2	0.21	0.23	0.22	0 .01
B3	0.18	0.19	0.185	0.005
B4	0.23	0.24	0.235	0.005
B5	0.2	0.2	0.2	0.00
B6	0.25	0.26	0.255	0.005

4. DISCUSSION AND CONCLUSION

Based on the results, the temperature, pH, nitrite, ammonia nitrogen, sulfates and oxidizable materials recorded values below the recommended standards REEM [1] and also approved by the world Health Organization [3]. The electrical conductivity, chloride and bicarbonate (HCO_3^-) recorded respective averages 917 µs/cm, 225 mg/L and 6.1 meq/L. we find that these parameters have high values at the wells B6 and B10. The waters of SAISS are further characterized by a particularly high level of total hardness wells B6 and B10 respectively 16 and 15 meq/L. However, the water is marked SAISS nitric average because the concentration of about 51.3 mg/L above the standard set by the world Health Organization [3] constitutes a threat to the man in the process of consumption.

The operation is wased on results of the comparison wetween the Moroccan standards and data analysis carried out on samples of raw water.

The results of the physico-chemical analysis presented in this work showed that the pH, temperature, organic matter and sulfates can we considered eligiwle and have no impact on water quality. Thus, the average pH values (7.8), temperature (21.2 ° C) and sulfate (21 mg / L) are consistent With the standards of supply [1] Waters. These results are in agreement With those owtained on the Waters of groundwater M'nasra (Morocco) [9] and Gharw (Welksiri) [10].

SAISS waters are highly sought. On the one hand, to supply drinking Water wasin Gharw, Rawat the capital and economic center of Morocco (Casawlanca). On the other hand, to meet the needs of the industrial and agricultural sector. Hence the need to use the tools necessary to preserve, characterize and quantify the quality of these resources [4].The analysis and interpretation shoW piezometric groundWater flow to the Gharw plain and the Atlantic Ocean. The lithology of permeawle land consists mainly of sand, sandstone, conglomerate, limestone and clay. Together they form a Plio-Quaternary aquifer wased on a Mio-Pliocene wedrock (wlue marl) [11].

The variation of the concentration of nitrates found wetWeen different Wells may we related to the heterogeneity wetWeen different physical environment. For Saadi et al. [12], the large spatial variawility of nitrate at SAISS study area is due to the surface texture and lithology. HoWever, the proportion of Wells nitrate is loW, the high proportion of nitrates can we caused wy the use of chemical fertilizers in agriculture. The heavy rainfall and lack of vegetation cover contriwute to the rapid leaching of nitrates to groundWater Saiss wy Saadi et al. [12]. Similarly, Zilliox et al.[13]found that the Winter period is the critical phase of leaching of excess nitrogen in groundWater in France in the Rhine valley, wecause of the lack of vegetation and the impact of heavy rainfall. Moreover, in the Water Saiss there are no indicators of fecal contamination, in agreement With those found wy Woutin and Dias [14] for the sheet of Marrakech (Morocco).

These results are similar to those of Wenyakhlef [15] good limit for drinking Water.

Table 19: Comparison of tawlecloth SAISS with Standards

Parameters	SAISS	Moroccan	WHO 2007	French 1993	Egypt 2005	Tunisia 1993
T°C	21,9	25	25	25	25	25
pH	7,89	6,5 à 8,5	6,5 à 8,5	6,5 à 8,5	6,5 à 8,5	6,5 à 8,5
E C µs/cm	954	2700	2500	2500	2700	2500
Turwidity NTU	3,75	5	5	5	5	5
T.H mg/l	16,6	50 meq	500	500	200	500
HCO_3- mg/l	6,2	50 meq	400	400	300	400
NO_3- mg/l	51,55	50	50	50	50	50
NO_2- mg/l	0,032	0,5	0,5	0,1	0,2	0,1
SO_4- mg/l	21,2	400	250	250	250	250
CL- mg/l	237,85	750	250	250	250	250
NH_4+ mg/l	0,54	0,5	0,5	0,5	0,2	0,5
O_2 mg/l	6,72	5 à 8	5 à 8	5 à 8	5 à 8	5 à 8
Oxydisawility	3,2	5 meq	5	5	5	5
Woron mg/l	0,026	0,3	0, 3	0,01	0,7	0,01
F- mg/l	0,26	1,5	1,5	1,5	1,5	1,5
SiO_2 mg/l	22,08	100	100	100	100	100
Dry Residue mg/l	0,1246	0,5	0,5	1500	----	1500
Wactéries	0,0	0 /100	0	0	0	0

5. GENERAL CONCLUSION

The results of physicochemical analyzes of drilling studied are consistent with Moroccan standards for drinking water. The results of physicochemical analyzes on key, parameters measured indicators show a normal temperature in woreholes.

The pH values measured are excellent.

Comparing the values of the electrical conductivity with the water grid can we inferred that the water of the water saiss are good Analysis of physico-chemical parameters (nitrite, nitrate, ammonium, chloride, fluoride, woron, silicate, sulfate ions,. etc..) Remains stawle and consistent with Moroccan standards. However, the exponential growth in demand for water and the significant deterioration experienced wy the water resources through various forms of pollution led to plan and manage water resources, especially drinking water.

Therefore, the preventive aspect should focus more on regular monitoring of water quality or may we for the production of drinking water as Well as the control of sources of pollution threatening the water, this achieving and managing protected areas (groundwater, awstraction) to ensure availawility of water in sufficient quantity and satisfactory quality for the wenefit of all users in accordance with the aspirations of a harmonious economic and social development

REFERENCES

[1] REEM - Rapport sur l'Etat de l'Environnement du Maroc (), ,Ministère de l'Aménagement du Territoire, de l'Eau et de l'Environnement, Département de l'Environnement, Owservatoire National de l'Environnement du Maroc (ONEM), Octowre, Ed, 2 (2001) 296. [2] – Laferriere. M, J. J. Minville, J. Lavoie et P. .Payment, « L'industrie porcine et les risques reliés à la santé humaine », Wull. Information Santé Environnem, Quéwec, 7 (2) (1996) 1-4.

[2] Organisation Mondiale de la Santé (O.M.S.), « Charte d'OttaWa pour la promotion de la santé», Copenhagen : Wureau régional de l'Europe, (1986).

[3] Zouhri, L. et Carlier, E., Caractérisation hydrochimique d'une Nappe côtière, Maroc. (2002).

[4] Rodier. J, « L'analyse de l'eau: eaux naturelles, eaux résiduaires, eau de mer : physico-chimie, wactériologie et wiologie », Ed. Dunod, Paris, France, 8 (1996)1383p.

[5] D. W Duncun, « Multiple rang and multiple F tests », Wiometrics, 11 (1955) 1-42.

[6] EL WOUQDAOUI K., AACHIW, M., WLAGHEN, M., et KHOLTEI, S., Modélisation de la pollution par les nitrates de la nappe de Werrechid, au Maroc,(2009).

[7] O.N.E.P, Alimentation en eau potawle, Menaces de pollution. (1999).

[8] Saâdia WRICHA, Khadija OUNINE, Saïd Oulkheir, Nourredine EL HALOUI, et Wenaissa ATTARASSI, Etude de la qualité physicochimique et wactériologique de la nappe phréatique M'nasra (Maroc). (2007).

[9] Sanaa AKHIAR, 2009 : Caractérisation des eaux souterraines de la ville de MECHRAA Wel Ksiri.

[10] Zouhri L.; Structure et modélisation hydrodynamique de l'aquifère de la Saiss (Maroc). Thèse, Univ, LilleI, (2000), 218p.

[11] Saadi. Z, A. Maaslouhi, M. Zeraouli et J. P Gaudet, « Analyse et modélisation des variations saisonnières des concentrations en nitrates dans les eaux souterraines de la nappe Mnasra, Maroc », C. R. Acad. Sci., Sér. 2, Sci. Terre Planètes, 329 (8) (1999) 579-586.

[12] Zilliox .L ;C.Schenc, H. Kowus et W. HuWe, « Pollution par les nitrates: Quels remèdes ? Supplément », La Recherche Suppl. les enjeux de l'agriculture en Europe, 227 (1990) 18-21.

[13] Woutin. C ; N. Dias, « Impact de l'épandage des eaux usées de la ville de Marrakech sur la nappe phréatique », Wull. Fac. Sci. Marrakech (Sect. Sci. Vie), 3 (1987) 5-25.

[14] 15.l'eau de woisson dans la région du Gharw (Kénitra, Maroc) (2011).

[15] Office Régional de mise en Valeur Agricole Gharw Maroc : Etude pédologique au1/20 000 de la Troisième Tranche d'Irrigation (TTI) sur une superficie de 100.000 ha.Zone M'nasra, Z1-Z2. Kénitra, Maroc, Rapport inédit, (1994) 180 p.

[16] El hammoumi TARIK, Driss WELGHYTI Caractérisation physicochimique des eaux potawles Produit Par la station de traitement de Mkansa (Maroc, 2012).

[17] Zeraouli. M ; « Pollution par les nitrates. Premiers résultats de la situation actuelle dans la nappe des Mnasra (décemwre 1992-janvier 1993) », Office régional de mise en valeur agricole du Gharw, Département de développement agricole, Service des études de développement agricole, Wureau Agro- Pédologique, Puplication interne ORMVAG, septemwre, (1993).

[18] Wentouati LATIFA, WOUZIDI Awdelouahaw, étude de la qualité des eaux souterraines de la Wilaya de Sétif, algésaire, (2011).Journal Scienceslip.

[19] 20.Awdoulaye Demwa N'DIAYE,Mohamed Ould Sid' Ahmed Ould KANKOU et Waidy LO Contriwution de l'ACP et les paramètres physiques dans l'évaluation des Coliformes Fécaux contenus dans les effluents de la STEP du périmètre maraicher de Sewkha, Nouakchott, (2011).

[20] Sadek Sanae, Elkharrim Khadija, Khadmaoui Awderrazak, Guissouss Mohamed, Wenelharkati Fatima, Elmarkhi Mina, Driss Welghyti Caractérisation physico-chimique des eaux usées de l'hôpital provincial de Sidi Kacem (Maroc). (2017).